PROFILED STEEL DECKING

This invention relates to profiled steel decking. More especially, the invention concerns profiled steel decking for use *inter alia* as a component of a composite slab comprising steel decking bonded to a layer of concrete cast in situ over the upper surface of the decking.

Composite structures produced by pouring light or normal weight concrete onto steel decking are used widely in the building industry for flooring and/or ceiling units. Conventionally, steel decking comprises one or more sheets of steel roll formed to create one or more crests and troughs separated by inclined webs. Shear stud connectors are traditionally used to provide enhanced bonding between the steel decking and the concrete layer. These shear stud connectors are placed in the trough positions of the decking and are enveloped by the concrete layer when it is cast.

Traditionally, the crests and troughs of profiled steel decking are generally flat with the corners between the crests and the uppermost ends of the inclined webs defined by acute angles. Also, the surfaces of the inclined webs of traditional steel decking are generally planar. The bending capacity of such profiles is limited.

Examples of traditional steel decking are to be found in US Patents 4144369, 4453364, 4593506, 4675238, 4726159, 4962622 and 3812636. In each of these documents, the corners between the crests of the decking and the uppermost ends of the webs are defined by acute angles.

The present invention sets out to provide improved profiled steel decking which exhibits clear advantages over traditional steel decking.

According to the present invention in one aspect, there is provided profiled steel decking which comprises a steel sheet roll formed to define at least two crests and a trough separated by inclined webs, decking being characterised in that the boundaries between the webs and the crests are radiussed to define corners each having a smooth curvilinear profile, the radius of each such corner being between 15 and 30mm.

Typically, the curvilinear corners have a radius of between 20 and 25mm.

Each inclined web of the steel decking may include two or more vertically spaced linear rows of embossments which extend outwardly from the outer surface of each inclined web. Each embossment may be generally circular in section and may be produced by roll forming. Each embossment of the uppermost row may be positioned above a land portion separating neighbouring embossments of the lowermost row. The diameter of each embossment preferably lies within the range 9.0 to 15.0mm. A typical diameter is 12.0mm. The spacing between the centres of neighbouring embossments preferably lies within the range 30 to 40mm. A typical spacing is 35mm. The vertical distance between the upper and lower rows may be between 27 and 37mm. A typical distance being 32mm.

The trough between the two crests of the decking may be formed with two stiffening ribs each of which is spaced generally equidistant from the lowermost end of the respective inclined web. The flange portion defined between the stiffening ribs may provide a site for shear stud connectors.

The width of each stiffening rib of the trough may be between 15 and 25mm. Typically, the width of one rib is 21mm and that of the other rib 20mm.

Each crest may be formed with a generally 'V' shaped projection which, in use, defines a shear connector between the decking and a concrete layer cast over the upper surface of the decking.

The angle subtended by each inclined web to the horizontal preferably lies within the range of 75 to 85°. A typical angle is 78.5°.

The decking is preferably roll formed from galvanised steel sheet whose gauge is between 0.8 and 1.3mm. Typically gauges are 0.9 to 1.2mm. The decking is preferably manufactured using a high grade steel having, typically, a yield value of 500 N/mm^2.

The invention will now be described by way of example only, with reference to the accompanying diagrammatic drawings, in which:-

Figure 1 is an end view of profiled steel decking in accordance with the invention;

Figure 2 is a scrap side view to an enlarged of a section of the decking illustrated in Figure 1;

Figure 3 is a scrap plan view from above of a section of the steel decking shown in Figure 1; and

Figure 4 is a side view of a connection between neighbouring steel deckings in accordance with the invention.

The steel decking illustrated in the drawings is roll formed from a single sheet of galvanised steel and comprises two crests 1 separated by a trough 2. Each crest is bordered with two outwardly inclined webs 3. The lower ends of the webs are bordered by outwardly extending end laps 4, 5. Each of these end laps 4, 5 is formed with interlocks 6, 7 respectively

which cooperate with complementary interlocks of neighbouring steel decks to increase the effective span of the overall steel decking.

The gauge of the steel sheet from which the decking is roll formed is typically between 0.9 and 1.5mm. A preferred gauge is 1.2mm. The steel sheet may be coated with a bonded plastics film for protective and aesthetic purposes. Alternatively, the sheet may be formed with a polyester coating.

As will be seen from the drawings, the corners between the crests 1 and the adjoining webs 3 are radiussed to produce a curvilinear profile 8. These curvilineal profiles increase the bending capacity of the decking and add strength particularly in the corner regions to inhibit failures which occur with traditional decking. The added strength enables the span lengths of the decking to be increased.

The actual radius of any given profiled corner 8 will depend *inter alia* on the required dimensions of the decking. Typically, the selected radius will be between 20 and 30mm. Preferred radii are 23.8 and 25mm. The span of each radiussed corner is typically between 30 and 35mm. A preferred span is 32.3mm.

As will be seen from Figures 1 and 2, each web 3 is formed with two vertically spaced linear rows of embossments 6 which project outwardly from the web surfaces. These embossments are produced during the roll forming process and the boundary between each embossment and the adjoining web surface is circular. Typically, the diameter of each embossment is in the range 9.0 to 15.00mm. A preferred diameter is around 12.0mm.

As will be seen from Figure 2, the embossments of the upper row are displaced linearly with respect to those of the lower row such that each upper embossment is positioned above a land portion of the web

sited approximately midway between neighbouring embossments of the lower linear row.

The rows of embossments extend along the entire length of each web and their presence enhances the bond between the decking and the concrete layer which, in use, is poured over the upper surface of the decking. Typically, the vertical spacing between the rows is in the range 30 to 35mm (measured between embossment centres); a preferred distance is 32mm. Typically, the centres of the embossments of the lower row are positioned between 13 and 18mm from the respective side laps 4, 5, a preferred distance being 15.9mm. The centres of the embossments of the upper row are typically positioned between 10 and 15mm below the lowermost point of the respective radiussed corner, a preferred distance being 12.2mm.

The spacings between the centres of neighbouring embossments of both the upper and lower rows is typically between 32 and 37mm, a preferred spacing being 35mm.

The shape and dimensions of the embossments may vary from those illustrated and discussed. Thus, the embossments could be ovoid or generally rectangular.

Each crest 1 includes a linear row of hollow projections 9 each of whose interior is generally dovetailed in section. These projections are produced during the roll forming process and define shear connectors between the steel decking and the concrete layer which is poured over the upper surface of the decking in use. The dovetail shaping of each projection allows hangers to be supported therein. The diameter of the lower neck of each projection is typically 12mm and the overall height of each projection is typically 15mm. As will be seen from the drawings, the joins between the crest and the projection are curvilinear. The crests are also formed with two inwardly projecting longitudinal ribs 11 for stiffening

purposes. The width of these ribs are typically between 9 and 10mm. A preferred width is 9.5mm.

The trough 2 is formed with two longitudinal upwardly projecting ribs 14, 15 separated by a solid land section through which shear stud connectors can be positioned. The presence of the ribs assists accurate location of shear stud connectors in use of the decking. The width of each rib 14, 15 is typically 21mm and the spacing between the ribs is typically 50mm.

Each end lap 4, 5 carries an interlock. These extend along the entire length of each end lap and are shaped in a complementary fashion to enable two or more steel decks to be joined together to produce a decking of any required width.

It will be appreciated that the foregoing is merely exemplary of steel decking in accordance with the invention and that various modifications can readily be made thereto without departing from the true scope of the invention as set out in the appended claims.